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Reference Manual
00809-0100-4002, Rev DA

Rosemount™ DP Level Transmitters and 1199 Diaphragm Seal Systems



Single Pressure Connection for Vessels Vented to Atmosphere.



High Pressure Connection

Low Pressure Connection for Vessels with with pressure other than Atmospheric.



2051L Direct Mount Level Transmitter.
or
3051L Direct Mount Level Transmitter.

Section 2 Understanding Remote Seal Systems

DP Level and remote seal system measurement	page 3
Terminology of system components	page 3
Understanding seal system performance	page 4
Balanced vs. Tuned-System assemblies	page 7
Specifying the right solution for vacuum applications	page 8
Diaphragm weld types	page 9
Differences between electronic remote sensors and capillary systems	page 10
Instrument Toolkit: seal ordering and application process	page 10
Rosemount Thermal Range Expander: proper use and applications	page 11
Thermal optimizer: proper use and applications	page 12
Submersible seal	page 13

2.1 DP Level and remote seal system measurement

DP Level is a reliable measurement solution for measuring level, density, interface, or mass of a process media inside a tank.

Remote seal system measurement is unaffected by agitation, foam, or internal obstacles. Remote diaphragm seals extend limitations due to process conditions such as high and low temperatures, corrosive processes, viscous mediums, and hygienic applications.

2.2 Terminology of system components

Figure 2-1 lists the basic components for seal assemblies.

Figure 2-1. Components on a Two and Single Seal Assembly

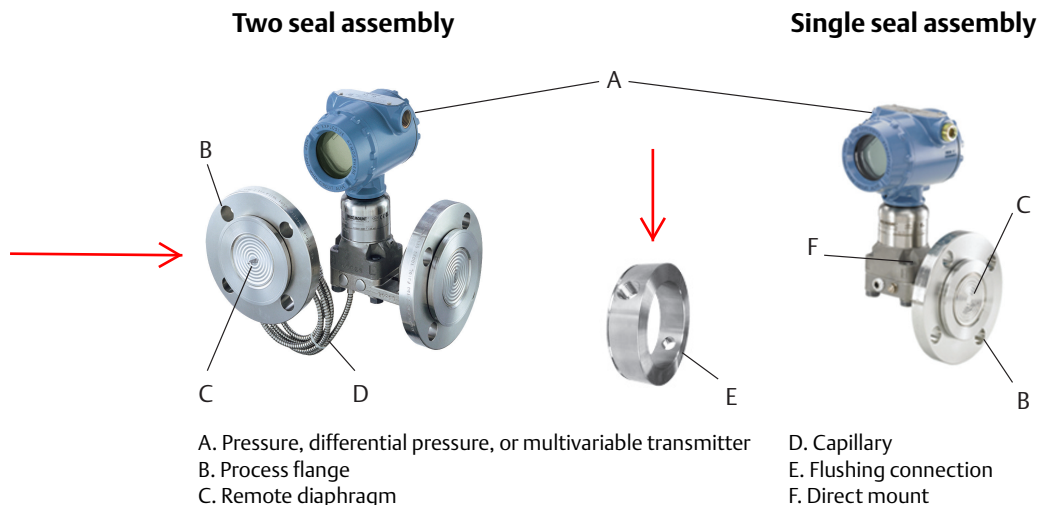
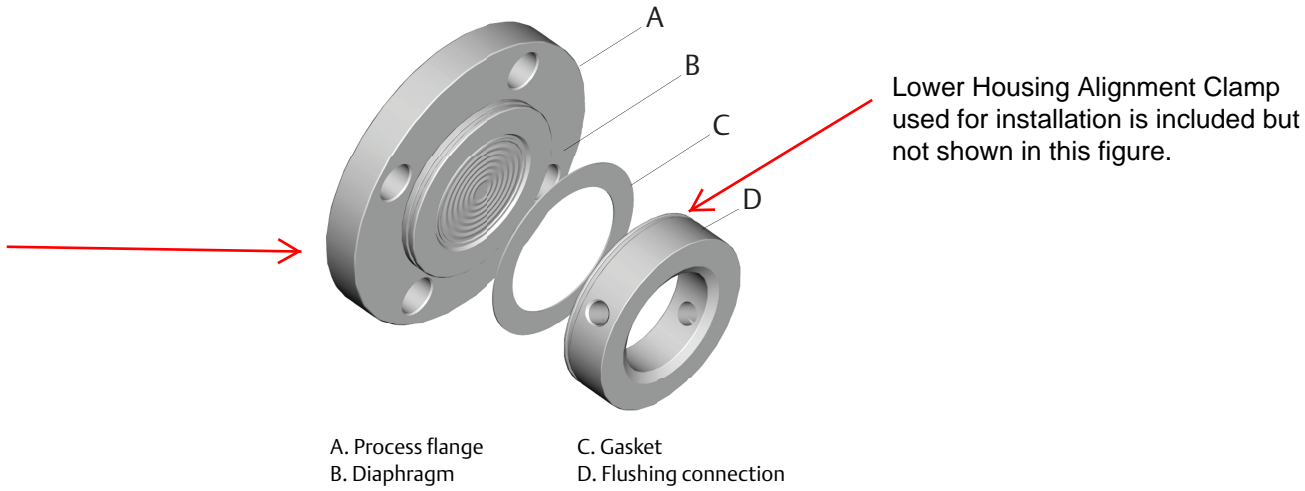


Figure 2-2. FFW Seal and Components



2.3 Understanding seal system performance

2.3.1 Volume temperature effects (process temperature effects)

Fill fluids expand or contract with temperature changes, creating a volume change that is absorbed by the diaphragm seal and is seen as back pressure at the transmitter. This back pressure creates a shift in the transmitter reading. For symmetrical or balanced systems, this error is usually minimal due to the back pressure being equal on both sides. However, head temperature effect is still present.

Note

Other factors that affect seal temperature effect include diaphragm thickness, seal type and size, capillary length and inner diameter.

Figure 2-3 on page 5 shows how diaphragm size can affect the measurement reading at the transmitter. For smaller seal sizes, such as the 1½-in. size, the amount of back pressure on the transmitter causes an additional 12.1 inH₂O error. Moving to the 2-in. size gives 1.7 inH₂O and the largest 3-in. size shown only has 0.5 inH₂O error. Using a larger diaphragm can drastically improve performance and provides a more stable reading.

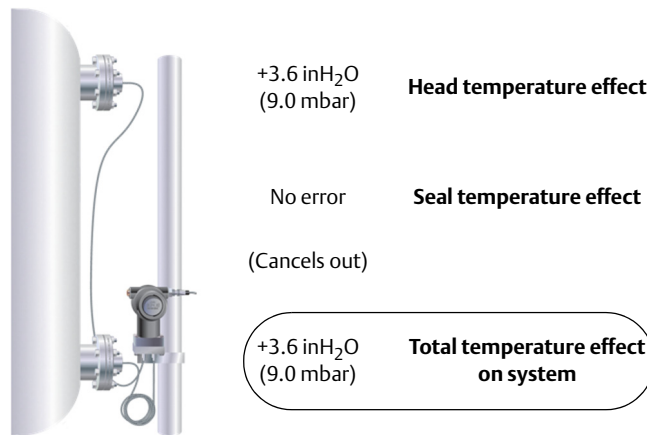
Note

Calculations done in Instrument Toolkit™ with Silicone 200 fill fluid with Rosemount™ 3051 Transmitter.

2.4 Balanced vs. Tuned-System assemblies

A balanced remote seal system is a symmetrical system that utilizes equal seals and capillary length on the high and low pressure sides of the transmitter. Since the capillary lengths are the same, each side ideally has the same amount of fill fluid, minimizing or completely eliminating the seal temperature effect due to equal pressure on both sides of the transmitter diaphragm. The balanced systems are still affected by the head pressure as shown in Figure 2-5.

Figure 2-5. Balanced System

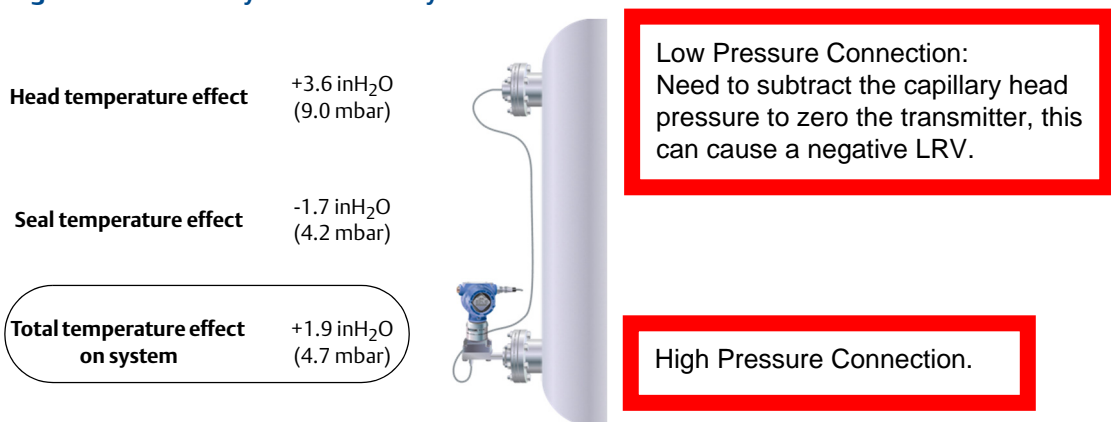


Note







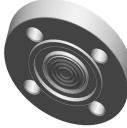
Temperature effects were calculated in Instrument Toolkit using a 2-in. (DN 50) FFW seal, Silicone 200, 10 ft. (3 m) between the taps, over a 50 °F (28 °C) temperature change.

Tuned-Systems assemblies are asymmetrical remote seal systems with one seal directly mounted to the high side of the differential pressure transmitter, and the other side connected to a seal via capillary. Another possible Tuned-System assembly is any remote seal system with unequal lengths of capillary or two different remote seals on the high and low pressure connections. Due to the unequal lengths of capillary, there are seal temperature effects. However, this seal temperature effect counters the head pressure from the oil-filled capillary and reduces total temperature effects on the entire system.

→ **Figure 2-6. Tuned-System Assembly**



Continue specifying a completed model number by choosing a remote seal type below:
The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Flanged seal assemblies		Process connections	
	FFW flush flanged seal	The Lower Housing Alignment Clamp is shown holding the flushing ring onto the transmitter or capillary flange.	★
	RFW flanged seal	1/2-in./DN 15 3/4-in. 1-in./DN 25/25A 1 1/2-in./DN 40/40A	★
	EFW extended flanged seal	1 1/2-in./DN 40/40A 2-in./DN 50 50A 3-in./headbox/DN 80/80A 4-in./headbox/DN100/100A	★
	PFW pancake seal	2-in./DN50 3-in./DN 80	★
	FCW flush flanged seal – RTJ gasket surface	2-in. 3-in.	
	RCW RTJ flanged seal	1/2-in. 3/4-in. 1-in. 1 1/2-in.	
	FUW and FVW flush flanged type seals	DN 50 DN 80	